

What is claimed is:

1. A hydrogen storage system for supplying hydrogen to a fuel cell employing a polymer membrane and to power a load in accordance with a predetermined electrical power requirement and to maintain the polymer membrane in a hydrated condition, said system comprising:

a main hydrogen storage site sized to contain at least a sufficient amount of hydrogen for the fuel cell to generate the predetermined electrical power requirement;

an auxiliary hydrogen storage site sized to contain an amount of hydrogen that is at least sufficient to allow said fuel cell to operate on a schedule basis to maintain the polymer membrane in the hydrated condition;

a manifold connected to the main hydrogen storage site and the auxiliary hydrogen storage site and having an outlet to deliver the hydrogen to the fuel cell;

the manifold being configured to allow the auxiliary hydrogen storage site to be renewed independently of the main hydrogen storage site; and

the manifold having a flow control network to allow said fuel cell to draw the hydrogen from the auxiliary hydrogen storage site to maintain the polymer membrane in the hydrated condition without utilization of hydrogen from the main hydrogen storage site.

2. The hydrogen storage system of claim 1, wherein the flow control network has pressure regulators configured such that the hydrogen from the auxiliary hydrogen storage site is delivered to the

outlet before the hydrogen stored in the main hydrogen storage site and check valves to prevent the flow of hydrogen between the main and auxiliary hydrogen storage site.

3. The hydrogen storage system of claim 2, wherein:

said main hydrogen storage site consists of two banks of compressed gas cylinders; and

said auxiliary hydrogen storage site is a single compressed gas cylinder.

4. The hydrogen storage system of claim 3, wherein:

the pressure regulators are first, second, and third regulators associated with said single compressed gas cylinder and one and the other of the two banks of the compressed gas cylinders and an outlet pressure regulator to adjust outlet pressure of the hydrogen at the outlet of the manifold; and

the first pressure regulator is set at a higher pressure than the second pressure regulator which is in turn set at a higher pressure than the third pressure regulator, such that the hydrogen is first drawn from the single compressed gas cylinder, the one of the two banks of compressed gas cylinders and then the other of the two banks of compressed gas cylinders.

5. The hydrogen storage system of claim 3, wherein:

the two banks of compressed gas cylinders are connected to the manifold to commonly feed the manifold with hydrogen; and

the pressure regulators are first and second pressure regulators associated with the single

compressed gas cylinder and the two banks of compressed gas cylinders, respectively; and

the first pressure regulator is set at a higher pressure than the second pressure regulator such that the hydrogen is first drawn from the single compressed gas cylinder to the outlet.

6. The hydrogen storage system of claim 2, wherein:

the main hydrogen storage site is a composite, carbon-fiber wrapped compressed gas cylinder;

the auxiliary hydrogen storage site of the hydrogen storage bank is a single compressed gas cylinder; and

the pressure regulators are a first pressure regulator associated with the single compressed gas cylinder, second and third second pressure regulators associated with the composite, carbon-fiber wrapped compressed gas cylinder, and an outlet pressure regulator to adjust outlet pressure of the hydrogen at the outlet of the manifold;

the second and third pressure regulators being situated in an in line relationship to regulate pressure of the hydrogen supplied from the composite, carbon-fiber wrapped compressed gas cylinder to a level below that regulated by the first pressure regulator such that the hydrogen is first drawn from the single compressed gas cylinder to the outlet.

7. A method of supplying hydrogen to fuel cell employing a polymer membrane to power a load in accordance with a predetermined electrical power requirement and to maintain the polymer membrane in a hydrated condition, said method comprising:

supplying the hydrogen to the fuel cell to generate electricity to power the load from a main hydrogen storage site charged with at least a sufficient amount of hydrogen for the fuel cell to generate the predetermined electrical power requirement;

supplying the hydrogen to the fuel cell on a scheduled basis from an auxiliary hydrogen storage site charged with an amount of hydrogen that is at least sufficient to allow said polymer membrane to remain hydrated; and

periodically renewing the auxiliary hydrogen storage site so that it remains charged with the amount of hydrogen to allow the fuel cell to operate on the scheduled basis without drawing hydrogen from the main hydrogen storage site.

8. The method of claim 7, wherein:

the hydrogen is delivered from both the main hydrogen storage site and the auxiliary hydrogen storage site to a manifold having an outlet to the fuel cell;

the manifold has check valves to prevent the flow of hydrogen from the auxiliary hydrogen storage site to the main hydrogen storage site and vice-versa;

the hydrogen from the auxiliary hydrogen storage site is delivered to the manifold at a higher pressure than that of the main hydrogen storage site such that the hydrogen will be first drawn from the auxiliary hydrogen storage site.

9. The method of claim 7, wherein the auxiliary hydrogen storage site is a single compressed gas cylinder and the auxiliary hydrogen storage site is renewed by periodically replacing the single compressed gas cylinder.

10. The method of claim 8, wherein the auxiliary hydrogen storage site is a single compressed gas cylinder and the auxiliary hydrogen storage site is renewed by periodically disconnecting the single compressed gas cylinder from the manifold and replacing the single compressed gas cylinder.